TREND report

City of Tucson: Addressing Water Resources through Green Infrastructure

Irene Ogata • published in the May 2015 issue

Question: How can the Tucson region balance limited water resources with the need to maintain a healthy community that includes an urban forest as a consumer of water?

Plan Tucson: City of Tucson General and Sustainability Plan 2013 was ratified by voters in November of 2013. One of the focus areas, Natural Environment, listed the following goals connecting climate change, water resources and the urban environment:

- A community that is resilient and adaptive to climate change.
- Abundant and appropriate use of native plants and trees.
- A network of healthy, natural open space managed for multiple benefits.
- A secure, high quality, reliable, long-term supply of water for humans and the natural environment.

Scott Avenue with curb cuts and water harvesting basins, 2014 Photo: Irene Ogata

Additionally there were nine energy and climate related policies, 11 water resource related policies and six green infrastructure policies. These Plan Tucson goals and policies follow similar discussions and recommendations outlined in a joint initiative by the City of Tucson and Pima County on planning efforts for sustainable water resources started in 2008, known as the *City of Tucson/Pima County Water & Wastewater Infrastructure, Supply & Planning Study*. The Study reiterated public values in ". . . need to balance human, environmental and economic needs for water;" and conservation was defined as ". . . reducing water usage through demand management, which primarily refers to water conservation efforts targeted to existing customers, and water efficiency measures."

Both Plan Tucson and the City-County Planning Study acknowledged the need for consistency in developing shared water efficiency goals and strategies at different scales of development. The City-County Study also identified that in order to prepare for climate change and drought, a multi-pronged approach was needed, which included the need to adopt common standards for water conservation mechanisms, such as water harvesting and greywater systems in which the two jurisdictions could complement each other's regulations and policies.

The joint Study culminated in 2010 with the The Action Plan for water sustainability was written as a living plan that could be modified as conditions change. Actions were identified under four broad categories of: 1) Water Supply, 2) Demand Management, 3) Respect for Environment and 4) Comprehensive Integrated Planning.

Guided by the City-County Action Plan, working at both the regional and local scale, the City of Tucson, Office of Integrated Planning; Pima County Regional Flood Control District and; Pima Association of Governments, Clean

Water Starts with Me program had been working directly to implement two actions recommended in the Demand Management section:

Goal 5: increase rainwater and stormwater use to reduce demands on potable supplies

5.1 Develop design guidelines for neighborhood stormwater harvesting

5.2 Analyze expanded water and stormwater harvesting potential and benefits

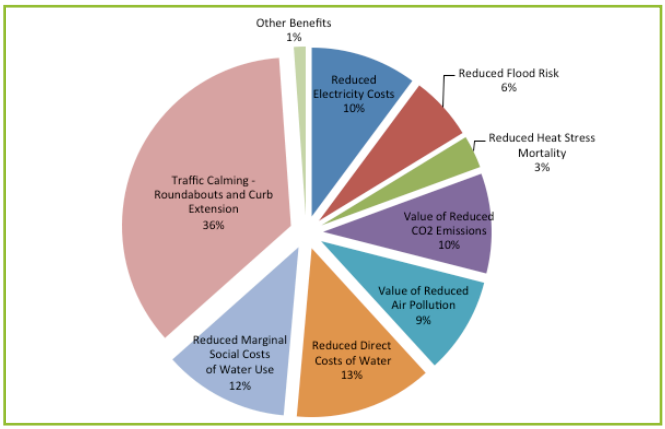
Three products were completed based on the recommendations above: (1) a *Green Infrastructure/Low Impact Development Guidance Manual for Residential Scale,* (2) an on-line catalogue of local case studies, and (3) a cost benefit analysis of the eight elements in the Guidance Manual plus two hypothetical case studies.

Blue Moon Community Gardens, 2014
Photo: Irene Ogata

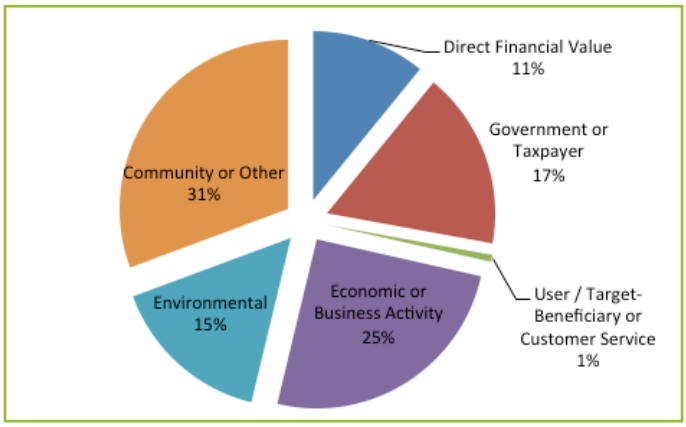
The Guidance Manual is non-regulatory and provides technical guidance for eight neighborhood-scale water harvesting techniques. These design strategies build value-added community benefits into roadway/stormwater infrastructure projects and neighborhood-scaled developments. Green infrastructure projects also contribute in addressing the question of maintaining a healthy urban canopy without consuming excessive potable water resources. The elements in the manual were tailored to address the local, arid southwest region.

The stormwater economic cost-benefit analysis was completed using a beta version the software, AutoCASE™, developed by Impact Infrastructure, LLC. The developers of the software added specific arid southwest elements. These include limited water resources associated with the uncertainties of climate change, the increase in urban heat island temperatures, extreme weather events of hotter and drier and vulnerabilities of at-risk populations exposed to heat stress. AutoCASE™ is a commercial software, but the economic software developers also created the Business Case Evaluator (BCE) spreadsheet, a free Excel spreadsheets associated with Envision™, a sustainable infrastructure rating system developed by the Institute for Sustainable Infrastructure and Zofnass, a program for Sustainable Infrastructure at the Harvard University Graduate School of Design.

AutoCASE evaluated the eight GI/Lid features in the manual individually and clustered in two representative local sites, one roadway project and once small commercial site. The analysis considered not only actual costs, including maintenance, but also societal benefits, accounting for risks to stakeholders and society as a whole. Specifically requested analysis included actual and societal cost of water, health related to urban heat islands and traffic calming elements and regional flood waters (versus combined sewer overflow experienced by other non-arid cities). Findings indicated substantial social, environment and economic benefits. The commercial site had benefits in reduced flood risk, better air quality, increased property values, reduced heat mortality and lower requirements for irrigation. The roadway project also had benefits due to traffic calming, reduced water cost, air quality and reduced urban heat island.



Net Present Value of Benefits—Roadway Project(AutoCASE Report)



Stakeholder Breakdown of Value—Roadway Project(AutoCASE Report)

The cost-benefit analyses illustrated the connection between stormwater management incorporating green infrastructure practices and the value to the community as stakeholders and taxpayers. Green infrastructure elements can have a reduced effect on direct and societal cost of water, highlighting increased tree plantings on public works projects does have community benefits. These practices contribute toward community resiliency and adaptation in light of climate change, and improving the quality of life in our local environment.

Irene is the Urban Landscape Manager in the City of Tucson. She is involved in city wide landscape issues and policies affecting public facilities; and an advocate for improving community livability as it impacts human and environmental health. She has organized conferences and workshops related to urban heat island and its relationship to street tree inventories, stormwater harvesting/green infrastructure/low impact development; facilitated team projects addressing the nexus between water and energy and issues of climate change and social/environmental justice. Irene has been collaborating with Pima County Regional Flood Control District and Pima Association of Governments in developing a local Green Infrastructure/Low Impact Development Guidance Manual, a catalogue of case studies, and beta testing a Stormwater cost-benefit analysis software. She can be reached at Irene.Ogata@tucsonaz.gov.